Airfoil Controlled Glide and Directional Control, Phase I Project

SBIR/STTR Programs | Space Technology Mission Directorate (STMD)

ABSTRACT

There is a growing desire for recovery systems that provide extended cross range capability and are steerable to enable precision landing of payloads. Using a recovery system that enables landings to specific coordinates can dramatically reduce suborbital flight recovery costs, future space return flight costs in the Earth's atmosphere. It also has potential in the Mars' atmosphere where a lightweight, low volume flight system such as a parafoil can increase the range of motion across the planet with increased lift or reduced drag. A fabric ram air canopy can be dramatically lighter weight than a foldable composite system while still being able to provide long range glide and descent rate control. Wizbe Innovations has developed a unique, lightweight fabric system to control airflow in textile based ram air canopies.Controlling the airflow provides glide and directional control to improve steering, potentially increase lift, and potentially reduce opening shock. Another potential advantage to moving the controls into the canopy is that it reduces field logistics by reducing retrieval to only the parachute canopy. Wizbe's controls are located within the parachute and have no winches, pulleys and wires outside the canopy.

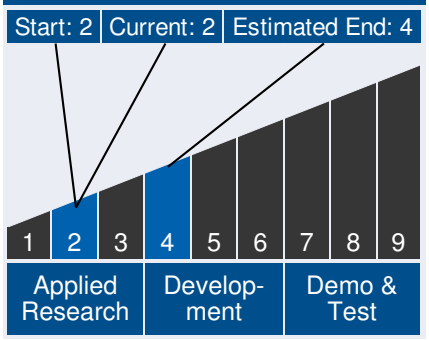
ANTICIPATED BENEFITS

To NASA funded missions:

Potential NASA Commercial Applications: The ability to actively control permeability in fabrics has many applications including in parachutes, clothing, shelters, sails, and filtration products. The airflow control can be integrated into the canopies in a variety of ways. NASA can use the system for a variety of applications including sub-orbital, re-entry into earth's atmosphere, or flights within other planet's atmosphere. The Sounding Rockets Program Office (SRPO), located at NASA Goddard Space Flight Center's Wallops Flight Facility, provides suborbital launch vehicles, payload development, and field operations support to NASA and other government agencies. With improved landing

Table of Contents

Technology Maturity



Management Team

Program Executives:

- Joseph Grant
- Laguduva Kubendran

Program Manager:

- Carlos Torrez

Continued on following page.

accuracy, without increasing payload weight, launches could be performed for less money and with improved landing locations. For re-entry, NASA, as well as multiple commercial space launch systems, are looking for improved landing accuracy. Many of the systems are using complex rocket systems, but a simple ram air canopy with improved landing accuracy could reduce the complexity of the landings and make the overall system less expensive. One of NASA Strategic Plan objectives is providing emergency abort capability and ensuring safe re-entry and landing. This ram air canopy design cuts across multiple strategic objects to enable safer flights, improves maturing transformative solutions, and enables improved emergency systems.

To the commercial space industry:

Potential Non-NASA Commercial Applications: The technology also has commercial potential in sports ram air canopies for increased steering capability, improved glide, higher safety margins, as well as potential to provide increased capabilities for hot air ballooning, gliders, and sailing. For the military, parachutes are a vital technology for moving Warfighters, ammunition, and other supplies to the battlefield. Personnel parachutes provide life support for paratroopers and are part of the ejection seat of aircraft for the pilot. Cargo parachutes are used to drop military equipment and supplies from aircraft. Many aircraft also use deceleration parachutes to slow down. For disaster relief, a parachute may also be used for delivering medicines, goods and other supplies to isolated victims. This actively controlled airflow fabric has several benefits that improve control in parachutes. The system incorporates an innovative control system using shape memory alloy that is likely to lead to a simple, effective fabric for airflow control with minimal weight gain and low volume changes. This actively controlled airflow provides will directional control and glide control (increased lift).

Management Team *(cont.)*

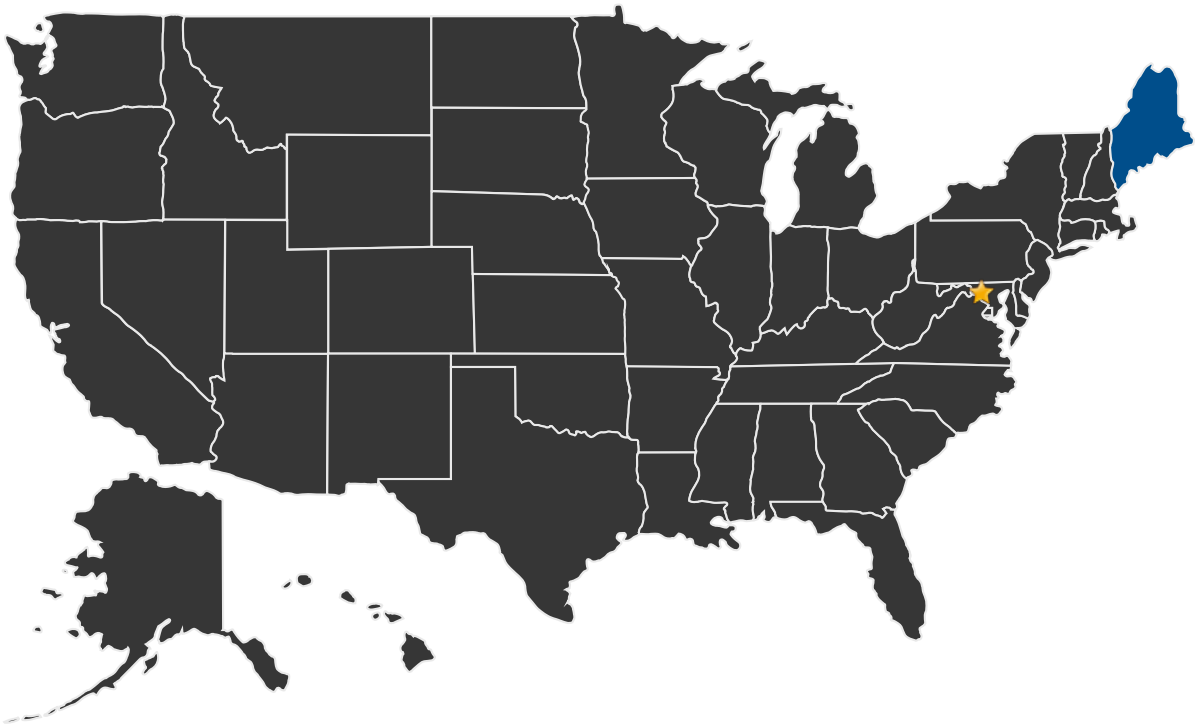
Principal Investigator:
- Stan Farrell

Technology Areas

Primary Technology Area:
Entry, Descent, and Landing Systems (TA 9)
└ Descent and Targeting (TA 9.2)
  └ Attached Deployable Decelerators (TA 9.2.1)

Airfoil Controlled Glide and Directional Control, Phase I Project

U.S. WORK LOCATIONS AND KEY PARTNERS



U.S. States With Work

Lead Center:
Goddard Space Flight Center

Other Organizations Performing Work:

- Wizbe Innovations, LLC (Manchester, ME)

PROJECT LIBRARY

Presentations

- Briefing Chart
  - (http://techport.nasa.gov:80/file/23546)

IMAGE GALLERY

Airfoil Controlled Glide and Directional Control, Phase I

DETAILS FOR TECHNOLOGY 1

Technology Title

Airfoil Controlled Glide and Directional Control, Phase I

Potential Applications

The ability to actively control permeability in fabrics has many applications including in parachutes, clothing, shelters, sails, and filtration products. The airflow control can be integrated into the canopies in a variety of ways. NASA can use the system for a variety of applications including sub-orbital, re-entry into earth's atmosphere, or flights within other planet's atmosphere. The Sounding Rockets Program Office (SRPO), located at NASA Goddard Space Flight Center's Wallops Flight Facility, provides suborbital launch vehicles, payload development, and field operations support to NASA and other government agencies. With improved landing accuracy, without increasing payload weight, launches could be performed for less money and with improved landing locations. For re-entry, NASA, as well as multiple commercial space launch systems, are looking for improved landing accuracy. Many of the systems are using complex rocket systems, but a simple ram air canopy with improved landing accuracy could reduce the complexity of the landings and make the overall system less expensive. One of NASA Strategic Plan objectives is providing emergency abort capability and ensuring safe re-entry and landing. This ram air canopy design cuts across multiple strategic objects to enable safer flights, improves maturing transformative solutions, and enables improved emergency systems.